CLAIMS:

1. A current-perpendicular-to-the-plane (CPP) magnetoresistive (MR) sensor comprising:

a giant magnetoresistive (GMR) stack; and

a layer of high resistivity material within the GMR stack, the layer of high resistivity material including a nanoconstriction precursor formed such that, when a punch current is applied at the nanoconstriction precursor, a conductive nanoconstriction is formed through the layer of high resistivity material at the nanoconstriction precursor.

2. The MR sensor of claim 1, wherein the nanoconstriction precursor comprises a thinned region in the layer of high resistivity material.

3. The MR sensor of claim 1, wherein the nanoconstriction precursor comprises a region in the layer of high resistivity material which has been implanted with metal ions by an ion beam.

4. The MR sensor of claim 1, wherein the nanoconstriction precursor comprises a region in the layer of high resistivity material which has been transformed to a low resistivity material by an electron beam.

5. The MR sensor of claim 1, wherein the nanoconstriction precursor comprises a region in the layer of high resistivity material which has been reduced to a metal via a reactive ion etch.

6. The MR sensor of claim 1, wherein a width of the conductive nanoconstriction is adjustable by adjusting an amplitude and duration of the punch current.

7. The MR sensor of claim 1, wherein a shape of the conductive nanoconstriction is adjustable by adjusting a thickness profile of the layer of high resistivity material.

8. The MR sensor of claim 1, wherein the layer of high resistivity material comprises an oxide material.

9. The MR sensor of claim 8, wherein the oxide material is selected from the group consisting of oxide compounds of Ti, Al, and CoFe.

10. A method of making a current-perpendicular-to-the-plane (CPP) magnetoresistive (MR) sensor comprising:

forming a giant magnetoresistive (GMR) stack including a layer of high resistivity material;

forming a nanoconstriction precursor in the layer of high resistivity material; and

applying a punch current to form a conductive nanoconstriction through the layer of high resistivity material at the nanoconstriction precursor.

11. The method of claim 10, wherein forming a nanoconstriction precursor comprises thinning a region in the layer of high resistivity material.

12. The method of claim 10, wherein forming a nanoconstriction precursor comprises:

coating an air bearing surface of the GMR stack with a thin metal layer; and

applying a precursor current to the GMR stack wherein the thin metal layer conducts the precursor current and wherein the precursor current conducted by the thin metal layer heats a thinned region of the layer of high resistivity material.

13. The method of claim 10, wherein forming a nanoconstriction precursor comprises implanting metal ions at a region of the layer of high resistivity material with an ion beam.

14. The method of claim 10, wherein forming a nanoconstriction precursor comprises transforming a region of the layer of high resistivity material to a low resistivity material with an electron beam.

15. The method of claim 10, wherein forming a nanoconstriction precursor comprises transforming a region of the layer of high resistivity material to a metal with a reactive ion etch.

16. The method of claim 10, wherein forming a nanoconstriction precursor in the layer of high resistivity material comprises:

selecting an area of high reader efficiency in the GMR stack; and

forming a nanoconstriction precursor in the layer of high resistivity material at the area of high reader efficiency.

17. The method of claim 16, wherein the area of high reader efficiency is located proximal to an air bearing surface of the GMR stack.

18. The method of claim 10, further comprising:

adjusting a thickness profile of the layer of high resistivity material to adjust a shape of the conductive nanoconstriction.

19. The method of claim 10, further comprising:

adjusting an amplitude and duration of the punch current to adjust a width of the conductive nanoconstriction.

20. The method of claim 10, wherein the layer of high resistivity material comprises an oxide material.

21. The method of claim 20, wherein the oxide material is selected from the group consisting of oxide compounds of Ti, Al, and CoFe.

22. The method of claim 10, wherein the layer of high resistivity material has a thickness of less than 6 Å.

23. The method of claim 10, wherein the GMR stack includes two magnetic free layers separated by a nonmagnetic layer.

24. The method of claim 23, wherein the nonmagnetic layer comprises a metal.

25. A method of forming a conductive nanoconstriction in a layer of high resistivity material, the method comprising:

forming a nanoconstriction precursor in the layer of high resistivity material; and

applying a punch current to form a conductive nanoconstriction through the layer of high resistivity material at the nanoconstriction precursor.

26. The method of claim 25, wherein forming a nanoconstriction precursor comprises thinning a region in the layer of high resistivity material.

27. The method of claim 25, wherein forming a nanoconstriction precursor comprises implanting metal ions at a region of the layer of high resistivity material with an ion beam.

28. The method of claim 25, wherein forming a nanoconstriction precursor comprises transforming a region of the layer of high resistivity material to a low resistivity material with an electron beam.

29. The method of claim 25, wherein forming a nanoconstriction precursor comprises transforming a region of the layer of high resistivity material to a metal with a reactive ion etch.

30. The method of claim 25, further comprising:

adjusting an amplitude and duration of the punch current to adjust a width of the conductive nanoconstriction.

31. The method of claim 25, further comprising:

adjusting a thickness profile of the layer of high resistivity material to adjust a shape of the conductive nanoconstriction.